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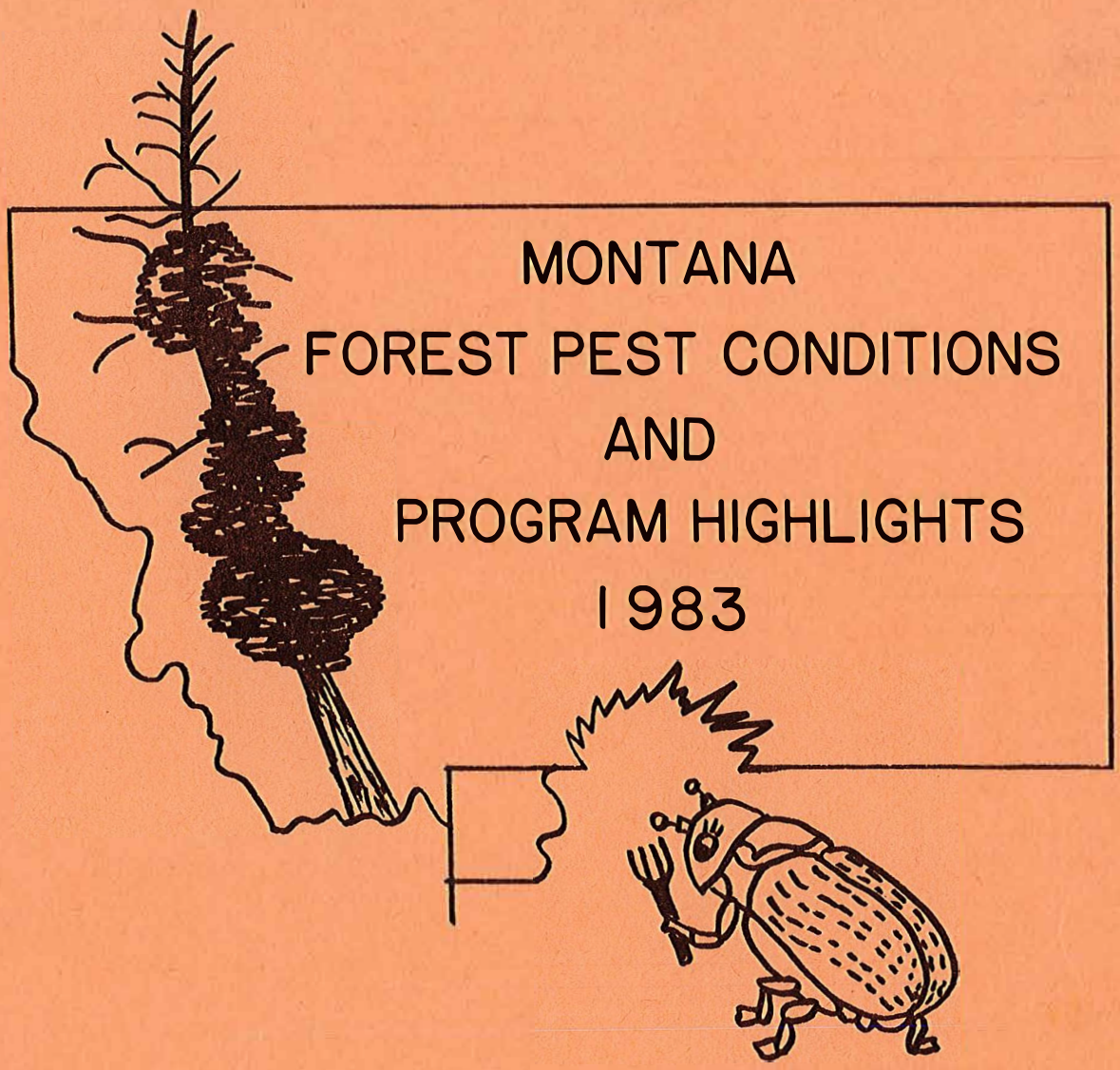

MONTANA
FOREST PEST CONDITIONS
AND
PROGRAM HIGHLIGHTS
1983

REPORT 84-2

MAY 1984

United States Department of Agriculture

Forest Service Northern Region

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Division of Forestry

MONTANA FOREST PEST CONDITIONS AND PROGRAM HIGHLIGHTS 1983

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INTRODUCTION

This report is the fourth since the adoption of a new format covering forest insect and disease conditions on all ownerships (Federal, State, and private) on a state-by-state basis. It has been prepared jointly by the USDA Forest Service, Cooperative Forestry and Pest Management; and the Montana Department of State Lands, Forestry Division. A similar report covering Idaho has been prepared by the USDA Forest Service and the Idaho Department of Lands.

This report provides an historical record of insect and disease outbreaks in Montana's forests and summarizes results of various projects underway to decrease the amount of damage caused by some of these pests. It also provides estimates of resource losses and shows the severity and magnitude of current insect and disease damage in Montana.

SUMMARY OF CONDITIONS

The mountain pine beetle is still the leading pine tree killer in Montana and Yellowstone National Park (NP). In 1983, it infested more than 1,522,000 acres of pines (four species) on all ownerships. Since 1981, the spruce beetle epidemic in western Montana has increased each year on Federal lands. In 1983 it infested 28,602 acres. It decreased on State and private lands to 7,091 acres in 1983. Continued weakening by heavy western spruce budworm defoliation and root diseases contributed to 6,890 acres with Douglas-fir beetle-caused tree mortality. Western balsam bark beetles were chronic throughout the subalpine fir type. Only 5,757 acres of ponderosa pine were infested by pine engraver beetles. Mortality caused by fir engraver and western pine beetle was scarce and scattered over western Montana.

The western spruce budworm infestation increased to 2.6 million acres in Montana and Yellowstone NP in 1983. Most of the increases were on forests east of the Continental Divide and the west side of Lolo National Forest (NF). The Douglas-fir tussock moth defoliated individual ornamental spruce and fir trees in Missoula, Polson, Somers, and near Clearwater Junction. The larch casebearer caused some very light defoliation in a few stands in western Montana. The larch budmoth, which has not been detected in Montana since the 1960's, defoliated more than 2,200 acres on the Flathead NF, Mission Mountains, and in Glacier NP. The pine needle sheath miner was detected in most pine stands over the State. It caused visible defoliation in 10,037 acres of lodgepole pine north and south of Bozeman. Pine butterfly populations increased in western Montana, but no visible defoliation was detected. The gypsy moth was discovered for the first time in Montana. Male moths were trapped in Glacier NP and in a Forest Service campground near Swan Lake. Western pine shoot borers were chronic in ponderosa pine plantations in western Montana. The fall webworm caused defoliation in shrubs over most of Montana. A defoliating magdalis weevil caused moderate defoliation in a lodgepole pine stand south of Bozeman. The honeysuckle aphid was detected for the first time in a honeysuckle planting near Huntley. The pine bark aphid was still active in some Scotch pine Christmas tree plantations south of Kalispell.

Root diseases were the most damaging tree diseases in Montana on many conifer hosts. These diseases include Armillaria root rot, brown cubical root and butt rot, laminated root rot, annosus root rot, and black stain root disease. Damage to western larch from Hypodermella blight and Meria needlecast was lower than in previous years. Lodgepole pine needlecast was quite evident again, especially in several Inland Empire Tree Improvement Cooperative progeny test plantings. Several reports of Douglas-fir needlecast were received. Swiss needlecast caused severe damage on Douglas-fir Christmas trees on the Eureka Ranger District, Kootenai NF. Several lodgepole pine stands on the Beaverhead NF had numerous new comandra blister rust infections. White pine blister rust is still a limiting factor to western white pine production. Impacts from dwarf mistletoes are high, but are gradually lessening, as management is designed with them in mind and special suppression projects are completed. Special dwarf mistletoe projects were completed on the Bitterroot, Flathead, Kootenai, and Lolo NF's. Fusarium root disease caused serious Douglas-fir seedling losses in a private nursery in Kalispell and in the Montana State Nursery in Missoula.

INSECTS

Bark Beetles

Mountain Pine Beetle

The mountain pine beetle is still the number one tree-killing insect in Montana and Yellowstone NP and is attacking all species of pines on all ownerships (figure 1 and Tables 1 and 2). The epidemic has decreased for the past 2 years in most of the old-growth stands of lodgepole pine. However, 2.9 million faders were detected in 1983. On Federal lands, infested acres went from 1.7 million in 1982 to 1.2 million in 1983; and on State and private lands from 293,168 to 233,863 acres. Some increases occurred on the Flathead, Lolo, Bitterroot, Custer, and Deerlodge NF's and on the Flathead and Fort Belknap Indian Reservations (IR's).

Table 1.--Acres of mountain pine beetle infestation on Federal lands in Montana and Yellowstone National Park, 1982 and 1983.

Ownership	1982 LPP[1]	1982 WBP	1982 PP	1982 WPP	1983 LPP	1983 WBP	1983 PP	1983 WWP
Bvrhd. NF	89,834	5,642	--	--	59,112	2,922	--	--
Btrt. NF	--	--	--	--	3,716	--	2,547	--
Custer NF	60	350	--	--	908	1,093	975	--
Drldg. NF	520	18,634	--	--	700	--	--	--
Flthd. NF	41,723	--	--	1,060	41,660	12,626	--	2,423
Gall. NF	432,492	15	200	--	168,847	19,800	30	--
Helena NF	411	640	--	--	263	--	--	--
Koot. NF	119,468	--	110	140	102,189	930	1,360	--
L & C NF	20	--	17,660	--	30	--	1,078	--
Lolo NF	18,089	150	80	580	39,201	4,161	54	250

Table 1, cont.

Ownership	1982 LPP[1]	1982 WBP	1982 PP	1982 WWP	1983 LPP	1983 WBP	1983 PP	1983 WWP
Glacier NP	31,619	--	5	40	27,041	83	--	200
Yellowstone NP	957,728	--	--	--	689,291	34,440	--	--
Blackfeet IR	7,606	--	--	--	5,400	--	--	--
Crow IR	--	--	1,180	--	--	--	4,300	--
Flathead IR	1,990	--	1,815	--	4,100	--	1,825	--
Ft. Belknap IR	--	--	633	--	1,986	--	30	--
N. Cheyenne IR	--	--	200	--	--	--	1,760	--
Rocky Boy's IR	--	--	--	--	800	--	30	--
BLM	--	--	8,464	--	13,839	--	26	--
TOTALS								
Nat'l Forests	702,617	25,281	18,050	1,780	16,626	41,532	6,024	2,673
Nat'l Parks	989,347	150	5	40	716,332	34,523	--	200
Indian Res.	9,596	--	3,828	--	12,286	--	7,945	--
BLM	--	--	8,864	--	13,839	--	26	--
All Federal	1,701,560	25,431	30,347	1,820	1,159,083	76,055	13,995	2,873

[1]LPP = lodgepole pine; WBP = whitebark pine; PP = ponderosa pine; WWP = western white pine

Table 2.--Acres of mountain pine beetle infestation on State and private lands in Montana, 1982 and 1983.

Reporting area	1982 LPP	1982 WBP	1982 PP	1982 WWP	1983 LPP	1983 WBP	1983 PP	1983 WWP
Beaverhead	44,397	894	--	--	7,285	1,280	--	--
Bitterroot	--	--	2,296	--	--	--	4,165	--
Custer	--	--	--	--	--	--	30	--
Deerlodge	--	--	--	--	--	--	--	--
Flathead[1]	28,989	200	--	623	93,051	--	3,971	30
Gallatin	140,000	25	60	--	64,790	12,306	--	--
Garnets	--	--	4,704	--	--	--	4,215	--
Helena	20	--	90	--	224	--	20	--
Kootenai	50,075	--	650	30	34,112	110	960	--
Lewis & Clrk[2]	--	--	78,069	--	40	--	568	--
Lolo[3]	14,138	--	--	--	30,742	320	4,145	250
Stillwater	15,138	700	--	1,500	3,619	1,542	--	2,330
TOTALS	293,168	1,819	85,859	2,153	233,863	15,548	18,074	2,610

[1]Includes Swan River
[2]Includes Judith River
[3]Includes Thompson River

In 1983, on all ownerships, 91,603 acres of whitebark pine, 32,042 acres of ponderosa pine, and 5,483 acres of western white pine were infested. The largest numbers of whitebark pine faders were within the boundaries of the Flathead and Gallatin NF's and Yellowstone NP.

Mortality in ponderosa pine stands increased greatly on the Bitterroot and Kootenai NF's, the Crow and Northern Cheyenne IR's, and State and private lands within the Flathead and Lolo NF's. Damage was still heavy in the Garnet reporting area. Nearly 26,000 killed ponderosa pines were detected in Montana in 1983.

The mountain pine beetle is chronic in old-growth stands of western white pine. In 1983, most faders were observed on the Flathead NF and Stillwater State Forest. The total number recorded in western Montana was close to 6,000 faders.

Beaverhead NF Reporting Area

The outbreak is decreasing rapidly in this reporting area due to the depletion of susceptible pines. Damage on private and Federal lands is still confined to the Centennial Mountains, west side of the Madison Range, and east sides of the Tobacco Root Mountains and Gravelly Range. Most faders were in the West Fork Madison River drainage.

Bitterroot NF Reporting Area

In 1983, there was an increase in the numbers of lodgepole and ponderosa pine faders detected in this unit (Tables 1 and 2). State and private lands affected were in the Eightmile, Threemile, and Ambrose Creek drainages near Florence and Stevensville, and in areas near Trapper Creek Job Corps Center and the Sula State Forest.

Custer NF Reporting Area

Ponderosa pine mortality was detected on the Sioux Ranger District (RD) and in the Beartooth Mountains. There was an increase in lodgepole pine faders on the Beartooth RD and the infestation in whitebark pine south of Red Lodge was still active.

Deerlodge NF Reporting Area

There was only a slight increase in lodgepole pine mortality in 1983 on the Jefferson RD.

Flathead NF Reporting Area

On Federal lands, the outbreak in lodgepole pine stands is decreasing within the north, middle, and south forks of the Flathead River. It is increasing on the Tally Lake and Swan Lake RD's.

Infestations in lodgepole pine on State and private lands in the Flathead NF area increased sharply in 1983. Over 93,000 acres of infestations were reported, compared to just under 29,000 acres reported in 1982. The activity on State and private lands was concentrated in the area of Little Bitterroot and McGregor Lakes southwest of Kalispell.

Gallatin NF Reporting Area

The outbreak decreased in all species of pine stands on Federal, State, and private lands in this unit (Tables 1 and 2). However, 265,743 acres of pine type in 1983 still contained 193,194 faders. Damage is occurring over the entire Gallatin area.

Helena NF Reporting Area

Damage remained relatively light in this unit. Most lodgepole pine mortality was in the Deep Creek drainage east of Townsend. Some small groups of faders were detected on the Canyon Ferry, Lincoln, and Helena RD's. There were only 20 acres of infested ponderosa pine detected on State and private lands.

Kootenai NF Reporting Area

Mortality is still heavy throughout the pine type in this reporting area. However, Tables 1 and 2 show that infested acres of lodgepole pine decreased in 1983 on lands of all ownerships. Infestations in ponderosa pine stands increased slightly and most damage was around McGregor Lake, Thompson Lakes, along the Fisher River, and in Pleasant Valley.

Lewis and Clark NF Reporting Area

Infestations in ponderosa pine stands have steadily decreased the past few years on the east side of this reporting area and reached a record low in 1983. Scattered, small groups of 5-30 killed trees still remain within the Judith River complex, Belt Creek, Judith Mountains, and Big Snowies. Scattered single killed trees were detected in the Little Snowies. Mortality was scarce in lodgepole pine stands and only a few small groups were killed on the south side of the Castle Mountains.

Lolo NF Reporting Area

Mortality in lodgepole pine stands is increasing on all ownerships in this reporting unit. The largest increase was within the Thompson River drainage (Table 2). Increased effort to reduce damage through salvage logging has not had much effect. There was also some increase in tree killing in ponderosa pine stands along the Clark Fork River drainage mainly on private lands. The beetle is still chronic in stands of mature western white pine on the west side of this unit.

Glacier National Park

Most susceptible pine stands in the Park have been infested, and the outbreak is decreasing rapidly. Very few faders were detected on the west side of the Park. The heaviest mortality is within the northeast quarter.

Yellowstone National Park

Table 1 indicates about a 300,000-acre decrease in the amount of lodgepole pine type infested during 1983. Mortality will persist for a few more years in the northeast quarter of the Park and may increase in the southeast quarter.

Blackfeet Indian Reservation

There was a decrease of about 2,000 acres of infested lodgepole pine in 1983. The beetle has depleted most of the highly susceptible pine on the Reservation.

Crow Indian Reservation

This outbreak in ponderosa pine stands in the Rosebud Mountains has been active for almost a decade and increased in 1983 (Table 1). Most faders were around the Corral Creek drainage.

Flathead Indian Reservation

Mortality in lodgepole and ponderosa pine stands increased in 1983 in the northwest quarter of the Reservation. This was mainly due to invasion by heavy beetle populations from the north and west of this area.

Fort Belknap Indian Reservation

Damage on the Reservation in the past has mainly been in ponderosa pine stands. In 1983 the beetle was detected in areas of lodgepole pine, and faders were present on about 2,000 acres.

Northern Cheyenne Indian Reservation

Table 1 indicates a substantial increase in the number of acres of ponderosa pine infested in 1983. Mortality was mainly along the east side of the Reservation.

Rocky Boy's Indian Reservation

There were 100 ponderosa and 484 lodgepole pine faders recorded on the Reservation in 1983. This was an increase over the number seen in 1982.

Garnets Reporting Area

Acres of infested ponderosa pine stayed at about the same level in 1983 as in 1982 on all ownerships in this unit (Table 2). Most of the damage occurred in the Blackfoot River drainage near Potomac and Lubrecht Experimental Forest. Some activity was also noted in the Clark Fork drainage near Bearmouth.

Stillwater State Forest Area

Infestations in 2,254 acres of lodgepole pine, 693 acres of whitebark pine and 1,165 acres of western white pine persisted on the west side of the Whitefish Range, the lower Swift Creek, and Fitzsimmons Creek drainages. Beetle activity intensified between Beaver Lake and Blanchard Lake, south of Whitefish Lake. Also, beetle attacks to lodgepole pines on State lands near the American Timber Mill at Olney increased in 1983.

Mountain Pine Beetle Projects

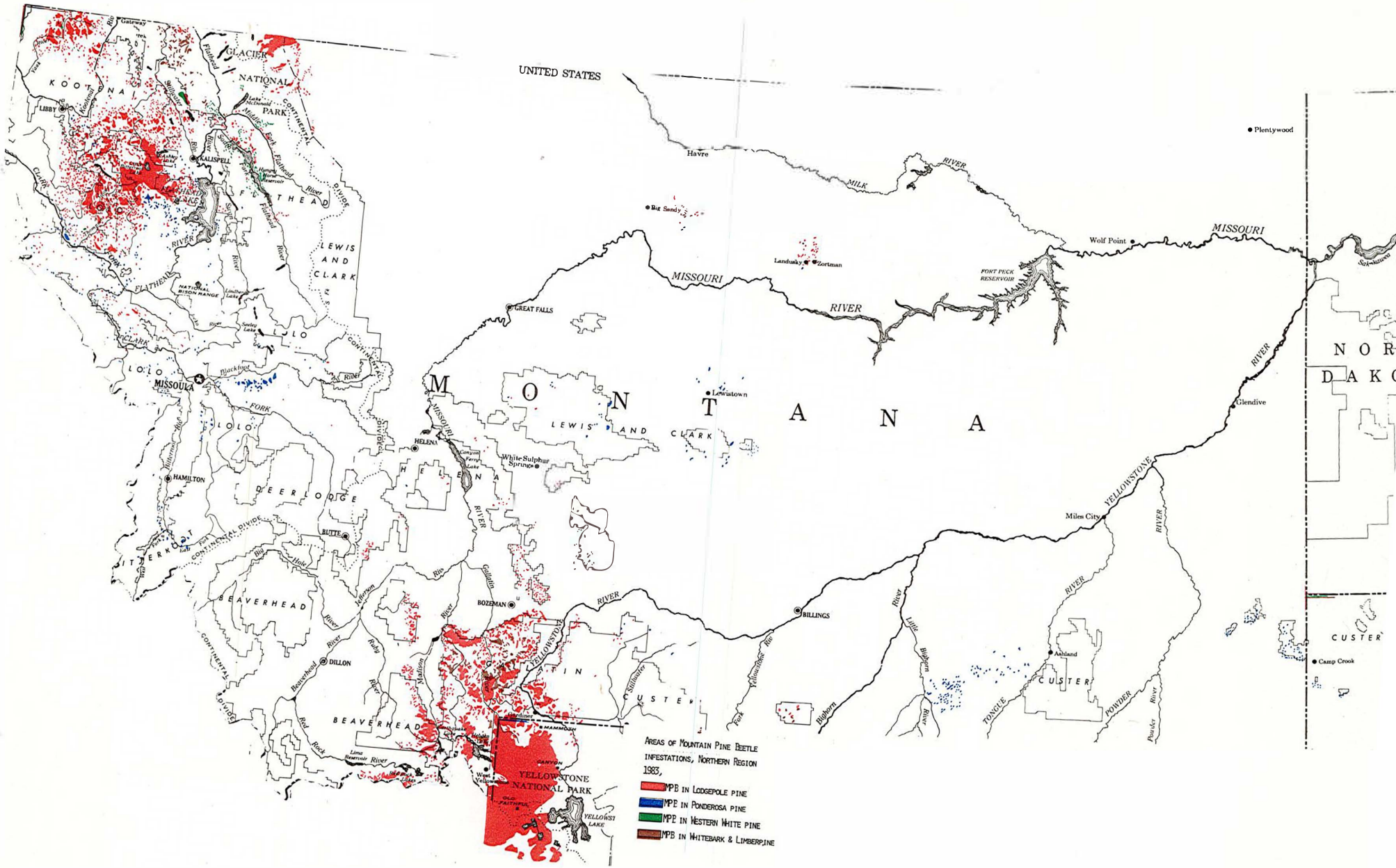
Cooperative Field Experiments with Pacific Southwest Forest and Range Experiment Station (PSW).--Two formulations of carbaryl (Sevimol-4 and Sevin XLR) were applied to individual lodgepole pine trees to prevent mountain pine beetle attack. Thirty-five trees were treated with 2 percent, 1 percent, and one-half percent dosages of each formulation. Only one tree treated with a one-half percent dosage of XLR was successfully attacked. Trees will be reexamined in 1984 to determine if the treatment will protect trees for 2 years.

Two formulations of pine oil (Norpene-65 and BDR-2) were tested. Materials were applied to 90 lodgepole pine trees. Fifteen trees were treated to a height of 2.5 m with each formulation; 15 trees were treated on two sides to a height of 5.2 m with each formulation, and 15 trees were treated on four sides to a height of 10.5 m with each formulation. With BDR-2, four trees were strip attacked that were treated to a height of 2.5 m, four were successfully attacked that were treated on two sides to a height of 5.2 m and one was successfully attacked and three were strip attacked that were treated on four sides to a height of 10.5 m. Of the trees treated with Norpene-65, one tree of of those sprayed to 2.5 m was successfully attacked. Two were attacked between treated strips of those treated on two sides to 5.2 m, and three were strip attacked of those treated on four sides to 10.5 m.

Impact Survey.--This survey was conducted to determine the effect of mountain pine beetle on whitebark pine stands in critical grizzly bear habitat, and to determine effect of western spruce budworm and Douglas-fir beetle on big game winter range on the Gallatin NF. Data are being analyzed and a report is forthcoming.

Preventive Sprays.--During June 1983, 220 whitebark pines were treated at Park Headquarters and at Mammoth Campground, Yellowstone NP, Pine oil was applied to the basal 2.5 m with a truck-mounted Bean hydraulic sprayer to prevent mountain pine beetle attack. Of the 220 treated, seven were successfully attacked above spray height, and five additional ones were attacked but the beetles were pitched out.

Videotape.--A videotape was completed and should be available soon concerning management options for mountain pine beetle in lodgepole pine stands.


UNITED STATES
M O N T A N A
KOOTENAI
GLACIER NATIONAL PARK
CONTINENTAL DIVIDE
FLATHEAD
LEWIS AND CLARK
LOLO
BEAVERHEAD
DEERLODGE
BITTERROOT
MISSOULA
HAMILTON
HELENA
BUTTE
BOZEMAN
DILLON
LIBBY
KALISPELL
GREAT FALLS
Havre
Big Sandy
Landusky
Zortman
Wolf Point
Plentywood
Lewistown
White Sulphur Springs
Glendive
Miles City
BILLINGS
Ashland
Camp Crook
MISSOURI RIVER
MILK RIVER
FORT PECK RESERVOIR
YELLOWSTONE RIVER
Big Horn River
Little Big Horn River
Tongue River
Powder River
CUSTER
YELLOWSTONE NATIONAL PARK
MAMMOTH
CANYON
OLD FAITHFUL
YELLOWST LAKE
West Yellowstone
Lima Reservoir
Clark Fork
Flathead River
Swan River
Blackfoot River
Bitterroot River
Big Hole River
Jefferson River
Madison River
Gallatin River
Beaverhead River
Ruby River
Red Rock River
Stillwater River
Yellowstone River
Clarks Fork
Yellowstone
Bighorn
Powder River
AREAS OF MOUNTAIN PINE BEETLE INFESTATIONS, NORTHERN REGION 1983,
MPB IN LODGEPOLE PINE
MPB IN PONDEROSA PINE
MPB IN WESTERN WHITE PINE
MPB IN WHITEBARK & LIMBERPINE

Spruce Beetle

The spruce beetle epidemic in western Montana has increased each year on Federal lands since it first started in 1981. Infested acres increased from 19,037 in 1982 to 28,602 acres in 1983. Damage decreased on State and private lands from 22,599 acres in 1982 to 7,091 acres in 1983 (Tables 3 and 4). Most of this decrease occurred on the Stillwater State Forest, in Stryker and Herrig Basins, the Swift Creek drainage, and the Upper Whitefish Lake area.

Areas infested in 1982 on the Flathead NF remained about the same in 1983, but the number of faders increased to 17,952 trees. Most damage was confined to the north, middle, and south forks of the Flathead River drainage. On the east side of the Kootenai NF, Fortine RD, 2,472 acres contained 1,046 killed spruce trees. Increased tree killing was detected in the southwest section of Glacier NP and 3,645 faders were recorded. In 1982, no spruce beetle damage was recorded on the Lolo NF, but in 1983, faders were detected on 1,497 acres on the Thompson Falls-Plains RD.

Continued logging of high-risk stands, logging, and the use of trap trees should reduce damage in 1984.

Trap Tree Project.--A trap tree program was initiated to reduce spruce beetle populations on 2,100 acres at Therriault Lakes, Kootenai NF. Fourteen hundred trap trees were e felled during May 1983 in stands with infestation levels ranging from 0.2 to 8.0 infested trees/acre. All trap trees became infested and were removed by October 1, 1982. Only one newly attacked tree was found within the treatment area during fall evaluations. Eleven hundred trap trees will be felled and baited in additional stands in 1984 to further reduce beetle populations. Lindgren Funnel Traps will be used to trap beetles in critical habitat areas where use of felled trap trees is limited.

Table 3.--Acres of bark beetle infestations (other than mountain pine beetle) on Federal lands in Montana and Yellowstone National Park, 1983.

Ownership	Douglas-fir beetle	Western balsam bark beetle	Pine engraver	Spruce beetle
Beaverhead NF	1,256	271	-	-
Bitterroot NF	1,566	-	80	-
Custer NF	799	730	183	109
Flathead NF	522	719	-	20,035
Gallatin NF	-	466	-	-
Kootenai NF	20	-	-	2,472
Lolo NF	201	237	-	1,286
Glacier NP	486	240	-	4,700
Yellowstone NP	1,624	-	-	-

Table 3, cont.

Ownership	Douglas-fir beetle	Western balsam bark beetle	Pine engraver	Spruce beetle
Flathead IR	140	-	-	-
Ft. Belknap IR	-	-	92	-
N. Cheyenne IR	-	-	4,843	-
Rocky Boy's IR	-	-	560	-
BLM	133	738	-	-
TOTALS				
Nat'l Forests	4,634	2,423	263	23,902
Nat'l Parks	2,110	240	-	4,700
Indian Reserv.	140	-	5,494	-
BLM	133	738	-	-
All Federal	6,747	3,401	5,757	28,602

Table 4.--Acres of bark beetle infestations (other than mountain pine beetle)
on State and private lands in Montana, 1983.

Reporting area	Douglas-fir beetle	Western balsam bark beetle	Pine engraver	Spruce beetle
Beaverhead	--	30	--	--
Bitterroot	20	--	--	--
Flathead	--	--	--	290
Gallatin	--	111	--	--
Lolo	63	--	--	211
Stillwater	--	--	--	6,580
Swan River	20	--	--	10
Thompson River	40	--	--	--
TOTAL	143	141	0	7,091

Douglas-fir Beetle

Damage by the Douglas-fir beetle on all ownerships increased from 3,551 acres in 1982 to 6,890 acres in 1983 (Tables 3 and 4).

Continued, heavy defoliation by the western spruce budworm has made trees more susceptible to this beetle especially on the east and west sides of the Madison River, Gallatin River drainage, the south half of the Bitterroot NF, the Pryor Mountains, and in the northwest corner of Yellowstone NP. Root diseases and stand disturbances have made trees attractive to the beetle southeast of Coram and in the Swan Valley; along the Fisher River; over the Lolo and Kootenai NF's; and in Glacier NP.

Western Balsam Bark Beetle

There was a decrease in the number of acres of subalpine fir infested by the western balsam bark beetle. Damage went from 9,000 acres in 1982 to 3,542 in 1983 on all ownerships (Tables 3 and 4).

Damage by this beetle is chronic in most areas containing a large percentage of subalpine fir in Montana. It is difficult to keep an accurate record of tree kill from year to year because many infested stands are at the head of drainages that generate winds too violent to fly at low atltitudes, or there is not enough time (and money) to map in more serious pest damage and the balsam bark beetle during the same flight. Subalpine fir type is only monitored when stands can be salvaged easily or when it is convenient to fly subalpine fir areas.

Pine Engraver

Tree killing by the pine engraver increased to 5,757 acres on Federal lands during 1983 (Table 3). Most of this occurred on the Northern Cheyenne IR where 4,843 acres of ponderosa pine were infested. No damage was detected on State and private lands.

Other Bark Beetles

No major damage by other bark beetles was detected in Montana during 1983. There were a few grand fir scattered over the Kootenai NF that were killed by fir engraver. The western pine beetle infested only five ponderosa pines along the west side of the Bitterroot Valley and a few north of Hot Springs, Montana.

DEFOLIATORS

Western Spruce Budworm

Acres of aerially visible western spruce budworm defoliation on all ownerships in Montana and Yellowstone NP increased for the second year. Defoliation increased from 2.3 to 2.6 million acres from 1982 to 1983 (Table 5 and figure 2). Increases occurred again on the Beaverhead, Custer, Gallatin, Helena, Lewis and Clark, and Lolo NF's. However, egg mass surveys indicated there may be less defoliation in 1984 on the Bitterroot, Lolo, and Helena NF's, and in the Garnet Mountains.

In 1983, 903,566 acres of defoliation occurred on State or private ownership (Table 6). This was an increase from the 887,162 acres of State and private lands defoliated in 1982. Tree mortality caused by continued severe defoliation combined with Douglas-fir beetles attacking weakened trees is increasing over large areas on the Beaverhead, Gallatin, Helena, and Bitterroot NF's, and in Yellowstone NP.

It is interesting to note in Table 7 that since 1960, visible defoliation in Montana has never dropped much below 1 million acres. In 1977, very close to 3 million acres were defoliated.

For the second year, data was collected from blocks sprayed with *Bacillus thuringiensis* (B.t.) on the Deerlodge NF in 1981. Data pertained to larval density, percent defoliation, and numbers of eggs and egg masses per square meter of foliage. The differences in percent defoliation between treatment and control blocks found during the first 2 years was not evident in 1983. Other data collected in 1983 are still being analyzed.

Spruce budworm silvicultural demonstration cutting blocks on the Gallatin NF were evaluated for population levels in 1983. Since they were first monitored in 1981, larval population levels have not differed among the different tree size classes. These same types of cutting blocks will be replicated on the Lolo NF and population evaluations will continue in 1984.

Table 5.--Acres of aerially visible western spruce budworm defoliation on all ownerships in Montana and Yellowstone National Park, 1983.

Unit	Acres		
	1982	1983	Differences
Beaverhead NF	532,038	575,789	+ 43,751
Bitterroot NF	385,401	195,732	- 189,669
Custer NF	32,085	68,780	+ 36,695
Deerlodge NF	198,453	205,833	+ 7,380
Flathead NF	7,400	2,973	- 4,427
Flathead IR	73,492	7,799	- 65,693
Gallatin NF	331,288	632,877	+ 301,589
Helena NF	232,987	366,234	+ 133,247
Kootenai NF	0	0	+ 0
Lewis & Clark NF	88,560	180,684	+ 92,124
Lolo NF	182,090	227,215	+ 45,125
Garnet Mtns. (BLM)	146,406	81,410	- 64,996
Yellowstone NP	41,476	44,221	+ 2,745
Total	2,251,676	2,589,547	+ 337,871

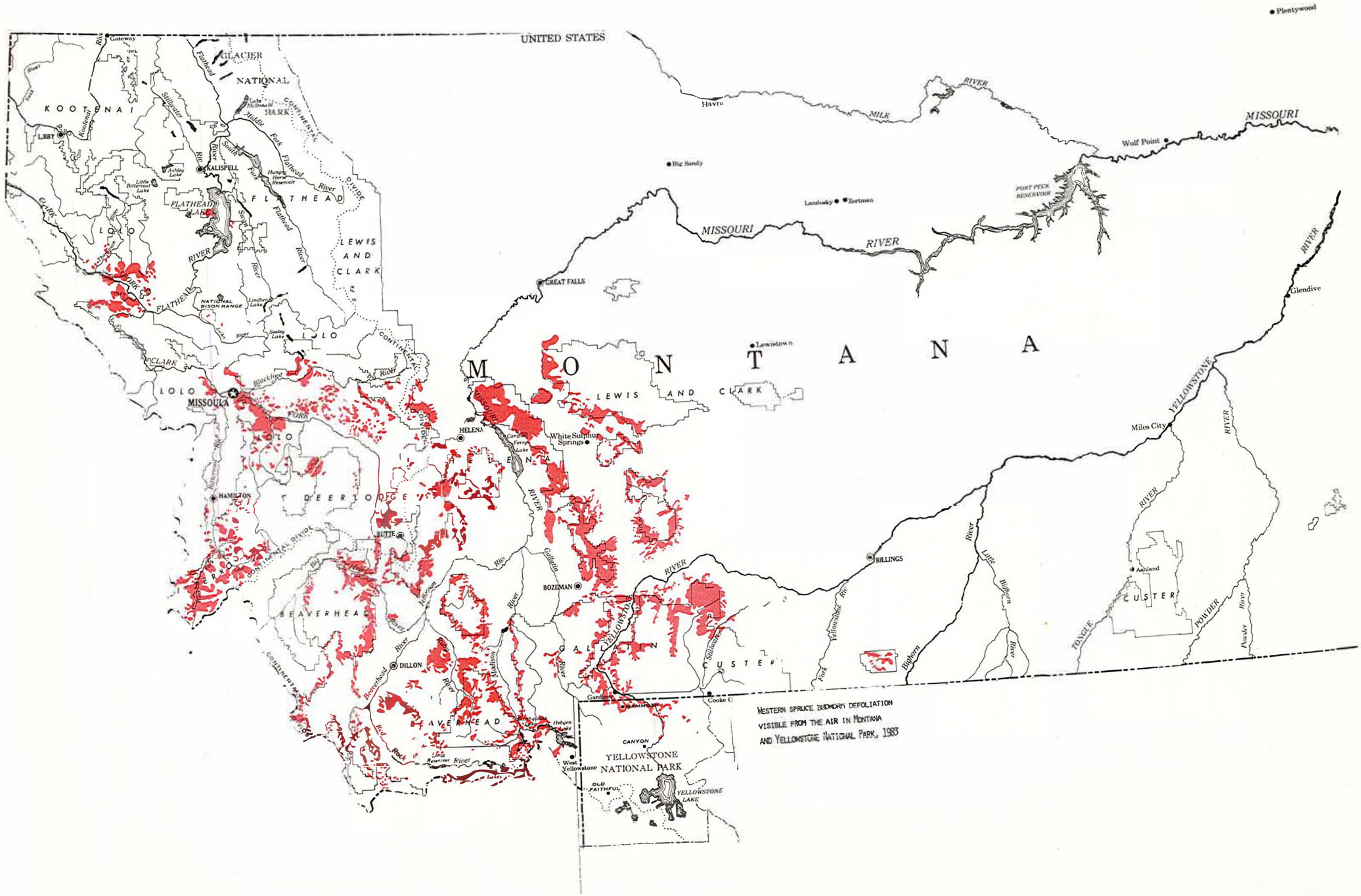

UNITED STATES
M O N T A N A
GLACIER NATIONAL PARK
KOOTENAI
LOLO
FLATHEAD
LEWIS AND CLARK
DEERLODGE
BEAVERHEAD
GALLATIN
CUSTER
YELLOWSTONE NATIONAL PARK
CANYON
OLD FAITHFUL
YELLOWSTONE LAKE
FORT PECK RESERVOIR
NATIONAL BISON RANGE
CONTINENTAL DIVIDE
MISSOULA
HELENA
BUTTE
BOZEMAN
DILLON
BILLINGS
GREAT FALLS
KALISPELL
LIBBY
HAMILTON
Havre
Wolf Point
Plentywood
Glendive
Miles City
Lewistown
Big Sandy
Landusky
Zortman
Ashland
Gateway
White Sulphur Springs
Cooke City
Gardiner
West Yellowstone
MISSOURI RIVER
MILK RIVER
YELLOWSTONE RIVER
BIGHORN RIVER
TONGUE RIVER
POWDER RIVER
WESTERN SPRUCE BUDWORM DEFOLIATION
VISIBLE FROM THE AIR IN MONTANA
AND YELLOWSTONE NATIONAL PARK, 1985

Table 6.--Acres of aerially visible western spruce budworm defoliation on State and private lands in Montana in 1982 and 1983.

Reporting area	1982	1983			
		Light	Moderate	Heavy	Total
Beaverhead	260,776	1,549	10,455	113,941	125,945
Bitterroot	53,786	8,723	30,029	970	39,722
Custer	9,718	0	40	13,569	13,609
Deerlodge	59,109	31,141	21,815	6,869	59,825
Flathead	0	1,633	2,939	0	4,026
Gallatin	173,049	36,491	45,451	231,302	313,244
Garnets	124,377	22,851	38,737	4,319	65,907
Helena	111,872	65,340	26,734	2,319	94,854
Kootenai	0	0	0	0	0
Lewis & Clark	7,429	34,324	28,597	11,959	74,880
Lolo	86,046	32,177	31,091	47,123	111,201
Thompson River	--	0	353	0	353
TOTAL	887,162	234,229	236,505	432,832	903,566

Table 7.--Acres of aerially visible western spruce budworm defoliation in Montana since 1960.

Year	Acres	Year	Acres
1960	2,496,890	1972	2,653,685
1961	2,808,400	1973	1,666,900
1962	2,888,990	1974	2,161,309
1963	1,877,320	1975	2,955,522
1964	1,918,180	1976	2,496,274
1965	2,578,890	1977	2,974,725
1966	795,130[1]	1978	2,395,431
1967	1,762,610	1979	2,195,897
1968	2,852,220	1980	848,342
1969	2,531,430	1981	894,713
1970	1,805,800	1982	2,210,200
1971	2,486,720	1983	2,545,326

[1] Bitterroot, Gallatin, and Lewis and Clark NF's not surveyed for budworm in 1966.

Douglas-fir Tussock Moth

Despite increased trap catches and increased reports of ornamental trees being defoliated in 1982, no tussock moth defoliation occurred on forested areas in 1983. The only confirmed reports of tussock moth defoliation were on a few individual yard trees in Missoula, Polson, Somers, and near Clearwater Junction in the Blackfoot drainage east of Missoula.

Pheromone-baited trap surveying was increased from 15 locations in 1982 to 33 locations in 1983 in the western part of the State. Only eight of 33 areas had trap catches exceeding 25 moths/trap compared to 10 of 15 areas in 1982. High catches were made at Albert Creek, Corral Creek, near Frenchtown, in Ninemile Creek, at Kerr Dam, and at Somers. Hence, it appears that population levels are either static or declining.

Sequential lower-crown larval sampling was done in the spring of 1983 at locations with high moth catches. In general, few larvae were found.

Larch Casebearer

In western Montana defoliation by the larch casebearer reached its lowest level during 1982. In 1983, visible defoliation again started to show up in chronically infested areas on the Flathead, Kootenai, and Lolo NF's and on the Flathead IR. Casebearer defoliation may have increased because infections by larch needle diseases decreased in 1983.

Larch Budmoth

The last major outbreak of the larch budmoth was in the mid 1960's. In 1966, 518,000 acres were defoliated in northwestern Montana. The outbreak lasted from 1963 to 1967. In 1983, defoliation was again detected. More than 1,600 acres occurred on the Flathead NF and 526 acres were mapped in Glacier NP. Defoliation that was probably caused by the budmoth was also observed in 1983 on the Kootenai NF and Flathead IR.

Pine Needle Sheath Miner

The pine needle sheath miner has caused moderate to heavy defoliation in ponderosa pine stands south and southeast of Helena for the past 3 years. In 1983, damage spread to other ponderosa pine stands around Helena. On the Gallatin NF, 10,037 acres of lodgepole pine were heavily defoliated north and south of Bozeman. All species of pine showed some evidence of sheath miner damage over most of the Gallatin NF. Scattered, light defoliation was observed over the Beaverhead NF also. Ponderosa pine stands on the Flathead IR were heavily defoliated in some areas.

Pine Butterfly

Observations indicated that populations of adult butterflies increased during 1982 and 1983 in ponderosa pine stands along the Bitterroot and Clark Fork River valleys and from Kalispell south into the Flathead IR. These were the areas contained heavy defoliation during the mid 1970's. Surprisingly, no visible defoliation was detected in 1983.

Gypsy Moth

The gypsy moth (figure 3) was discovered for the first time in Montana during 1983. It was reported in South Dakota in 1982 and 1983, and a small infestation was found in Pullman, Washington in 1983. The Forest Service, National Park Service, and Montana Division of Forestry placed pheromone traps in 40 different campgrounds during the summer. One male moth was captured in Apgar Campground in Glacier NP and one in a campground near Swan Lake, Montana. The trapping program will be intensified in 1984.

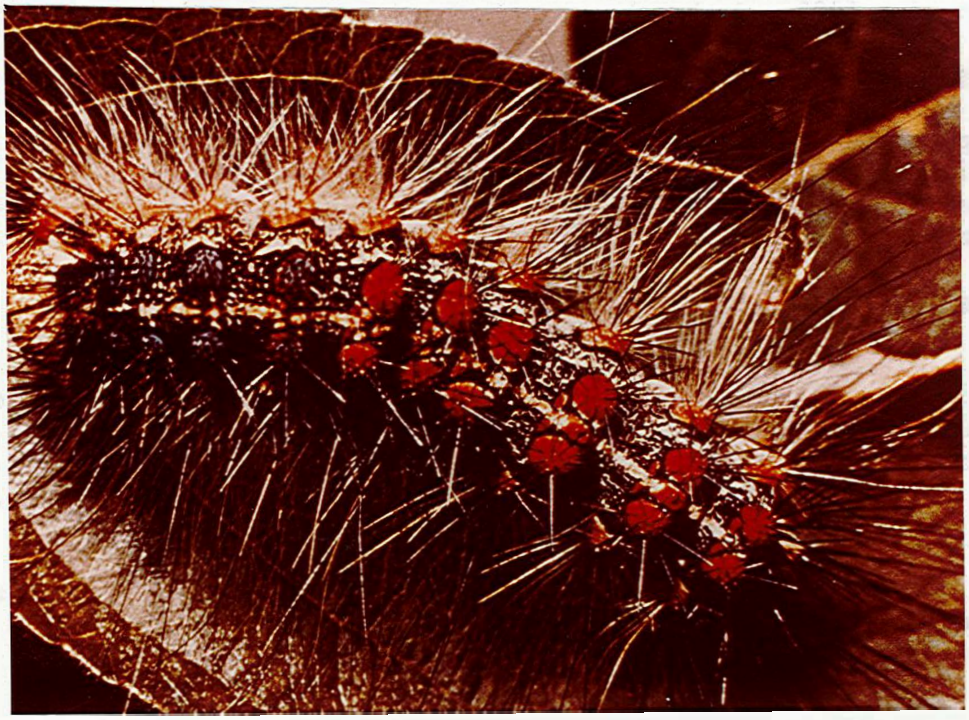


Figure 3.--A mature gypsy moth larva resting on a leaf. Its head end is on the left side of the photo.

OTHER INSECTS

Western Pine Shoot Borer

This is a chronic pest in ponderosa pine stands mainly in western Montana. Studies in 1982 showed that an average of 9 percent of the trees in a plantation had infested internodes. Height growth reduction was about 30 percent for individual trees.

Seed and Cone Insects

A total of 88 cone-bearing Douglas-fir trees near Missoula, Wise River, and Gardiner were implanted or injected with the systemic insecticide acephate to measure its effect on cone and seed insects. Although all treatments were

applied in mid- to late April, bud development varied from very tight buds, to swollen buds, to open flowers at Wise River, Gardiner, and Missoula, respectively. All treatments provided some protection, with the greatest protection to both cones and foliage at Wise River (very tight buds). Data analysis has not yet been completed.

Fall Webworm

Chokecherry and various shrubs were heavily defoliated by the fall webworm over most of Montana during 1983. Outbreaks usually last 1 to 2 years.

A Defoliating Weevil

A stand of lodgepole pine near a thinning area south of Bozeman, Montana was moderately defoliated by a magdalis weevil during the summer of 1983. Adult weevils are attracted to fresh slash but do not infest it. Instead, they defoliate surrounding standing pines by eating holes in the needles.

Honeysuckle Aphid

During July 1983, the honeysuckle aphid was detected for the first time in Montana. It was feeding on Tatarian honeysuckle which is used in shelterbelts and windbreaks. The infestation was located on the grounds of the Montana Experiment Station east of Billings near Huntley.

Pine Bark Aphid

Some Scotch pine Christmas tree plantations in the Bigfork and Kalispell areas were again damaged by pine bark aphids. Most of the growers applied insecticides and were able to reduce aphid population levels and subsequent damage.

DISEASES

Root Diseases

Root disease infested sites are common on Montana forests. These diseases pose a challenge to the forest manager because they often intensify with stand management. Root diseases usually cause site problems rather than tree or stand problems; once present they persist for many years, sometimes for the life of the stand and into the next rotation. Diseases caused by the five pathogens associated with most root disease problems are Armillaria root rot, brown cubical root and butt rot, laminated root rot, annosus root rot, and black stain root disease. The first three of these appear to be the most prevalent and are associated with the most damage (figure 4). These diseases frequently occur together or in combination with other fungi and bark beetles. Trees weakened by root disease become easy targets for bark beetles. Principal hosts of the most prevalent root pathogens are Douglas-fir and grand fir, followed by western hemlock, Engelmann spruce, subalpine fir, western white pine, other pines, western larch, and western redcedar.

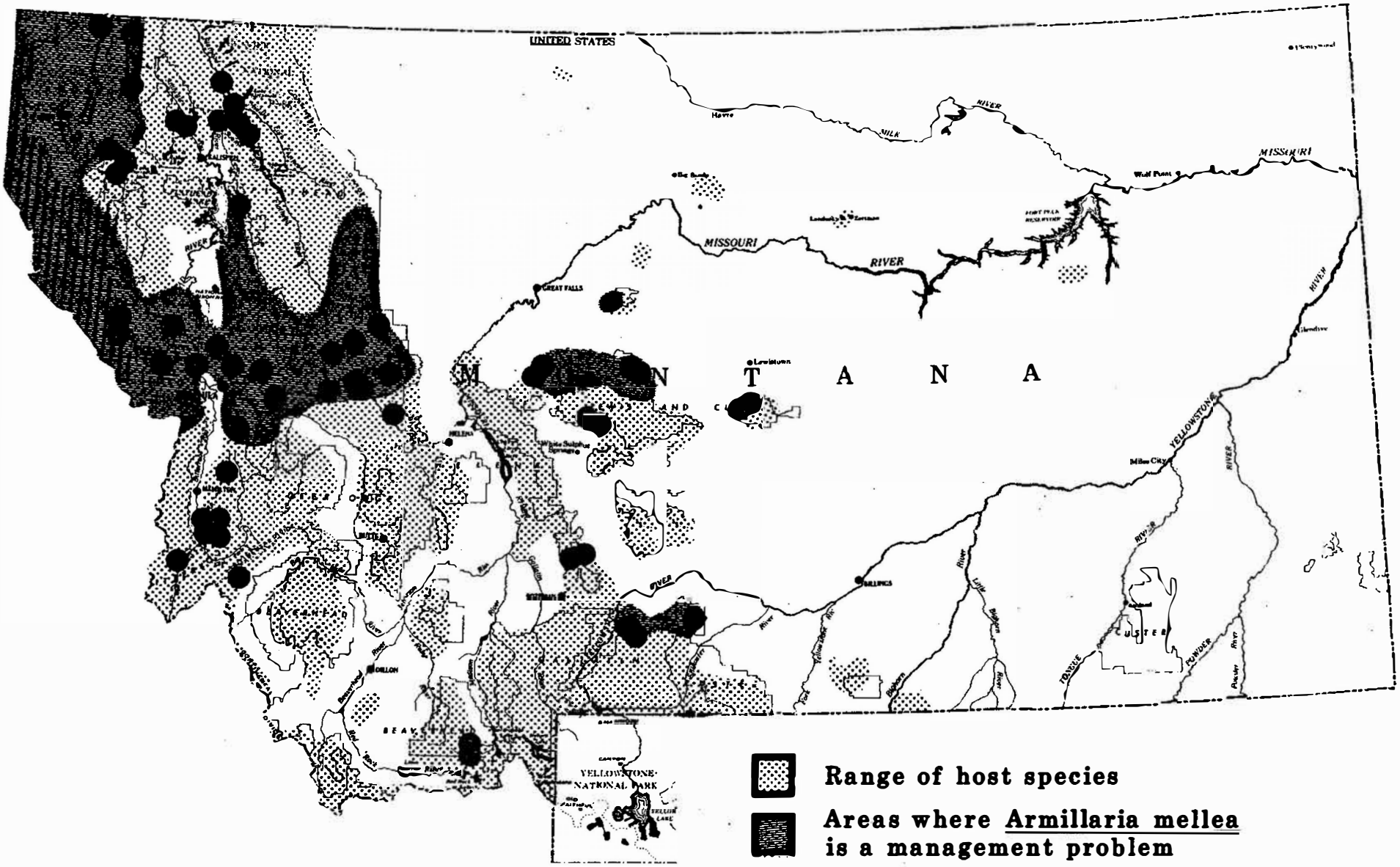


Figure 4.--Areas in Montana where the three most prevalent root diseases are considered management problems.

Some specific observations made in 1983 and reports on special root disease projects follow.

Brown cubical root and butt rot was found causing a significant amount of mortality and wind breakage in Douglas-fir on Iron Mountain on the Big Timber RD, Gallatin NF.

Armillaria root disease caused scattered mortality in a young plantation on the Ninemile RD, Lolo NF. Species affected were western larch, lodgepole pine, ponderosa pine, Douglas-fir, and subalpine fir. Soil compaction is severe and may be contributing to the wide range of species affected.

Much of a Douglas-fir stand on the Lincoln RD, Helena NF, has died from a combination of brown cubical root and butt rot and western spruce budworm defoliation. An evaluation of this area led to a report on ecology and management of the disease.

Armillaria root disease frequently causes mortality in 10- to 20-year-old stands and reduces stocking levels in both planted and natural regeneration. Some species appear to be susceptible when young, but possibly outgrow it. Permanent plots were established in three stands on the Lolo NF to measure impact and monitor any changes in species susceptibility. These stands will be precommercially thinned and then be remeasured every 5 years.

A cooperative Armillaria root disease control demonstration between the Flathead IR, Bureau of Indian Affairs (BIA), and Forest Service was completed. The severely infected Finley timber sale area was divided into blocks receiving different treatments. These include overstory removal with thinning of the understory, ponderosa pine and western larch seed tree cuts, clearcuts with planting or natural regeneration of ponderosa pine and western larch, clearcuts with stump pulling, and commercial thinnings. The project will demonstrate effects of various silvicultural practices on development of Armillaria root disease.

Two evaluations of effects of partial cutting effects on Armillaria root disease were established on the Flathead IR. BIA foresters have collected data for 3 years on 335 permanently marked trees within a salvage area in the Ducharme Creek timber sale. Mortality rates have been high in Douglas-fir. A stem map demonstrates the pattern of mortality related to stumps of salvaged trees.

The second partial cutting evaluation was established in the fall of 1983 in the Charity timber sale area. A stand with a moderate mortality rate was divided into two blocks. One block will be commercially thinned, leaving the most vigorous appearing trees while achieving spacing goals. The other block will be left undisturbed. All trees in each three-quarter-acre block are tagged and stem mapped. Cutting was scheduled for winter of 1983-84.

Foliage Diseases

Nearly 60 percent of the disease-related pest detection reports received for identification this year were foliage problems. About one-fourth of these were Douglas-fir needlecast.

Discoloration of western larch, caused by a combination of larch casebearer, Hypodermella blight, and Meria needlecast occurred on groups of trees this year rather than generally over most of the western larch type as in previous years. The Eureka RD, Kootenai NF, again reported severe infections by Swiss needlecast reducing Christmas tree harvests. Wild Douglas-fir trees were chlorotic (figure 5) in many stands contracted to local cutters. Severe infections result in loss of foliage once trees begin to warm up. Cutters reported difficulties in finding suitable trees for harvest.

An extensive survey of Scots pine Christmas tree plantations to determine presence and extent of Lophodermium needle cast was made by the Montana Department of Agriculture and Forest Service. The disease has caused considerable losses in northern Idaho plantations, and was found near Bigfork, Montana, in 1982. This survey was made to determine need for a quarantine on infected planting stock. No new collections of the fungus were made despite the extensive survey and the fungus was judged not to have spread; a quarantine will not be imposed now. Numerous other needle diseases were found in the plantations, particularly Lophodermella needlecast.

Figure 5.--Swiss needlecast on Douglas-fir needles, lower pair. Upper pair are uninfected.

Canker Diseases

A Colorado State University graduate student, in cooperation with the Forest Service, established some long-term comandra blister rust study plots in lodgepole pine stands on the Beaverhead NF in 1982. Several of these plots were reexamined in 1983. In one plot near Crystal Park, some trees had as many as 30 new cankers not visible the previous year.

White pine blister rust hazard was estimated for a stand in the Earthquake timber sale on the Superior RD, Lolo NF. This area is scheduled for harvest in 1985. Site history and physiographic characteristics were compared with these features of an adjacent clearcut. Ribes populations and percent infection in natural western white pine regeneration were measured in the clearcut. A survey of Ribes populations following harvest will aid in improving preharvest estimation techniques. This information may be used to modify harvest and site preparation techniques to suppress Ribes populations and to select appropriate resistance levels in western white pine planting stock.

Dwarf Mistletoes

Impacts from dwarf mistletoes are gradually decreasing as silvicultural prescriptions are designed with them in mind and as special suppression projects are completed. Suppression projects were completed on 654 acres on the Bitterroot NF, 240 acres on the Flathead NF, 100 acres on the Kootenai NF, and 1,169 acres on the Lolo NF. Post-suppression evaluations were made on 262 acres on the Bitterroot NF and 240 acres on the Flathead NF. Evaluations for potential suppression projects were made on the West Fork and Stevensville RD's of the Bitterroot NF, and on the Superior, Seeley Lake, Plains/Thompson Falls, and Missoula RD's of the Lolo NF. All these stands qualified for pest management funding.

The Douglas-fir dwarf mistletoe spread and intensification plots on the Lolo NF were examined; data analysis is underway.

Nursery Diseases

Fusarium root disease caused extensive losses to container-grown conifers at the Alpine Nursery in Kalispell. Several host species were involved, but damage was most apparent in Douglas-fir. The disease caused widespread mortality as well as stunting and chlorosis. Fungicide applications did not adequately control the disease.

This disease also occurred on container-grown Douglas-fir at the Montana State Nursery in Missoula, but infection levels were much lower than at the Alpine Nursery. Infections came from Douglas-fir seed lots already infested with the pathogens.

Western gall rust was found on several ponderosa pine seedlings planted in a Champion Timberlands seed orchard at Plains. The infected stock was from their adjacent bareroot nursery, but had not shown symptoms when planted.

Shot-hole disease of chokecherry grown for windbreak plantings occurred at the Montana State Nursery in Missoula. Disease severity is related to cool, wet weather during the growing season.

INLAND EMPIRE TREE IMPROVEMENT COOPERATIVE

The Inland Empire Cooperative is a group of Federal, State, and private agencies dedicated to selection and propagation of superior trees that produce more and better seed which will eventually result in improved planting stock. Members have pooled their resources and established test plantings, seed orchards, and seed production areas. Several of these areas were visited by entomologists and pathologists in 1983 to determine the nature and extent of insect and disease problems.

Progeny Test Plantings

Condon ponderosa pine (Flathead NF) - Nearly one-half the trees examined were or had been infested by the western pine shoot borer. Occasional sawfly injury and presence of western gall rust was noted.

Rye Creek ponderosa pine (Burlington Northern Timberlands) - A few trees were infested with western pine shoot borer and a few trees showed deer browsing damage.

Lubrecht ponderosa pine (University of Montana) - A few trees were infested with western pine shoot borer, a few had comandra blister rust cankers, and a few showed rodent damage.

Camas Creek lodgepole pine (Bitterroot NF) - No significant pest damage was seen.

Dodge Creek lodgepole pine (Kootenai NF) - No significant pest damage was seen.

Savanec lodgepole pine (Lolo NF) - Nearly 85 percent of the trees had Lophodermella needlecast, and a few were infected with western gall rust.

Condon lodgepole pine (Flathead NF) - No significant pest damage was seen.

Blue Mountain western larch (Lolo NF) - About 43 percent of the trees were missing or dead from undetermined causes. A harsh site is suspected.

Alexander Creek western larch (Kootenai NF) - About 10 percent of the trees were infected with Meria needlecast.

Condon western larch (Flathead NF) - The only significant damage noted was frost heaving. A large number of grasshoppers was noted, but their feeding was mainly on other vegetation.

Lubrecht western larch (University of Montana) - Nearly 52 percent of the trees were infested with western spruce budworm, and about 34 percent were missing or dead from undetermined causes.

Yaak/Kilbrennan Douglas-fir (Kootenai NF) - About 21 percent of the trees were infested with the Cooley spruce gall adelgid.

Quartz western white pine (Kootenai NF) - No significant pest damage was seen.

Seed Orchard

Missoula ponderosa pine seed orchard (State of Montana) - About 35 percent of the trees were infested with western pine shoot borer. A few trees had western gall rust.

APPENDIX

DIRECTORY OF PERSONNEL

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Wendel J. Hann - Ecologist
Rene M. Mangin - Toxicologist/Pesticide Coordinator
Janet Johnson - Research Natural Area Coordinator
James W. Byler - Pathology Group Leader
Oscar J. Dooling - Forest Pathologist
Suzanne H. Dubreuil - Forest Pathologist
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Catherine A. Stewart - Forester
Carma J. Gilligan - Biological Laboratory Technician
Jerald E. Dewey - Entomology Group Leader
Mark D. McGregor - Forest Entomologist
Kenneth E. Gibson - Forest Entomologist
Wayne E. Bousfield - Forest Entomologist
Scott Tunnock - Forest Entomologist
Larry E. Stipe - Forest Entomologist (CANUSA)
Hubert E. Meyer - Biological Technician
Robert D. Oakes - Biological Technician

COOPERATIVE TRAINING

The Montana Department of State Lands and USDA Forest Service, Northern Region, conduct training programs to assist field-going personnel and forest managers in detection, identification, and management of forest pests. Training sites are located at Kalispell, Missoula, Butte (Helena in 1983), and Bozeman. The training program is separated into two parts: a "basic" session in which field identification and life cycles of pests are stressed, and an "advanced" session where management alternatives are discussed. The basic session is designed for field-oriented personnel such as stand exam crews; the advanced session is for silviculturists and others involved in developing management prescriptions.

In 1983, basic sessions were held at Helena and Kalispell. Advanced sessions were conducted at Bozeman and Missoula. Sessions will alternate at each site each year. In 1984, basic sessions will be held at Bozeman and Missoula, and advanced sessions at Butte and Kalispell.

In order for instructors to be effective and participants to benefit most, enrollment at each session is limited to 30 . The basic sessions are 2 days, with half the time spent indoors in a lecture format and half the time spent in field identification and discussion. The advanced sessions are 3 days with about one-third devoted to indoor lecture/discussion periods, and the remainder to field exercises.

COMMON AND SCIENTIFIC NAMES

Insects

Balsam woolly adelgid	*Adelges picea* (Ratzeburg)
Cooley spruce gall adelgid	*Adelges cooleyi* (Gillette)
Defoliating weevil	*Magdalis gentilis* LeConte
Douglas-fir beetle	*Dendroctonus pseudotsugae* Hopkins
Douglas-fir tussock moth	*Orgyia pseudtosugata* McDunnough
Fall webworm	*Hyphantria cunea* (Drury)
Fir engraver	*Scolytus ventralis* LeConte
Gypsy moth	*Lymantria dispar* Linnaeus
Honeysuckle aphid	*Hyadarhis foeniculi* (Passerini)
Larch casebearer	*Coleophora laricella* (Hubner)
Larch budmoth	*Zieraphera improbana* (Walker)
Lodgepole pine terminal weevil	*Pissodes terminalis* (Hopkins)
Mountain pine beetle	*Dendroctonus ponderosae* Hopkins
Pine bark aphid	*Pineus silvestris* Annand
Pine butterfly	*Neophasia menapia* (Felder & Felder)
Pine engraver	*Ips pini* (Say)
Pine needle sheathminer	*Zelleria haimbachi* Busck
Spruce beetle	*Dendroctonus rufipennis* Kirby
Western balsam bark beetle	*Dryocoetes confusus* Swaine
Western pine beetle	*Dendroctonus brevicomis* LeConte
Western pine shoot borer	*Eucosma sonomana* Kearfott
Western spruce budworm	*Choristoneura occidentalis* Freeman

Diseases

Annosus root rot	Fomes annosus (Fr.) Cke.
Armillaria root rot	Armillaria mellea Vahl.: Fr.
Black stain root disease	Verticicladiella wageneri Kend.
Brown cubical root and butt rot	Phaeolus schweinitzii (Fr.) Pat.
Chokecherry shot-hole	Coccomyces hieralis Higgins
Comandra blister rust	Cronartium comandrae Peck.
Douglas-fir dwarf mistletoe	Arceuthobium douglasii Engelm.
Douglas-fir needlecast	Rhabdocline pseudotsugae Syd.
Dwarf mistletoe	Arceuthobium spp.
Fusarium root disease	Fusarium oxysporum Schlect. Fusarium soloni (Mart.) Sacc.
Hypodermella blight	Hypodermella laricis Tub.
Laminated root rot	Phellinus weirii (Murr.) Gilb.
Lophodermella needlecast	Lophodermella concolor (Dearn.) Dark.
Lophodermium needle cast	Lophodermium pinastri (Schrad.: Hook.) Chev.
Meria needlecast	Meria laricis Vuill.
Swiss needlecast	Phaeocryptopus gaumanni (Rhode) Petrak
Western gall rust	Endocronatrium harknessii (Moore) Hirat.
White pine blister rust	Cronartium ribicola Fischer: Rabh.

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